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10/625,490

07/22/2003

A. Farid Issaq

ACT-377

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EXAMINER

TRAN, THIEN F

ART UNIT

PAPER NUMBER

2895

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DELIVERY MODE

10/10/2008

PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

|                              |                                      |                                     |  |
|------------------------------|--------------------------------------|-------------------------------------|--|
| <b>Office Action Summary</b> | <b>Application No.</b><br>10/625,490 | <b>Applicant(s)</b><br>ISSAQ ET AL. |  |
|                              | <b>Examiner</b><br>Thien F. Tran     | <b>Art Unit</b><br>2895             |  |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 25 July 2008.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 11, 12 and 14-19 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 11, 12 and 14-19 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)                       | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | Paper No(s)/Mail Date. _____                                      |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>08/08/2008</u> .  | 6) <input type="checkbox"/> Other: _____                          |

## **DETAILED ACTION**

### ***Continued Examination Under 37 CFR 1.114***

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 07/25/2008 has been entered.

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 11, 12, 14, 15 and 17-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hawley et al (US 6,437,365) in view of Jain et al (US 6,107,165) and Gangopadhyay (US 6,114,714).

Regarding claims 11, 12, 17 and 18, Hawley et al teach a metal-to-metal antifuse comprising (Fig 6): a tungsten plug (18) disposed in a via in an insulating layer (16) disposed above and in electrical contact with a lower metal interconnection layer (14); an antifuse layer (20) disposed above an upper surface of the tungsten plug, the antifuse layer comprising a lower SiN layer (22) considered as a lower adhesion-promoting layer, a middle layer (24) comprising amorphous silicon, and an upper SiN

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layer (26) considered as an upper adhesion-promoting layer; a layer of a barrier metal (30) disposed over the antifuse layer forming a second electrode, the layer of the barrier metal comprising a titanium nitride; and a second insulating layer of oxide layer (52) disposed over the insulating layer (16), the antifuse layer, and the layer of the barrier metal.

Hawley et al. do not teach that the layer of the barrier metal formed of tantalum nitride. Jain et al. teach titanium nitride and tantalum nitride can be used for barrier metal (col. 4, line 66 - col. 5, line 3). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to substitute the titanium nitride of Hawley with tantalum nitride as taught by Jain since titanium nitride and tantalum nitride are art recognized barrier metal material.

Hawley et al. in view of Jain do not teach the middle layer (24) comprising hydrogen doped amorphous carbon. Gangopadhyay teaches a hydrogen doped amorphous carbon used for antifuse material (2, Fig.1A). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to substitute amorphous silicon with hydrogen doped amorphous carbon since amorphous carbon could reduce ON-OFF switching and leakage current.

Hawley, Jain and Gangopadhyay disclose the same structure as claimed but do not explicitly teach that the SiN layers (22 & 26) are adhesion-promoting layers.

However, the adhesion-promoting layer of the present invention is formed of SiN or SiC (see page 3, Summary section in the specification, paragraph 0007); therefore, the SiN layers (22, 26) on both sides of the middle layer (24) of hydrogen doped amorphous

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carbon using the same material disclosed by the present invention inherently function as "adhesion-promoting layer" and would meet the recited term "a lower adhesion-promoting layer" and "an upper adhesion-promoting layer".

Regarding claim 14, Hawley et al. teach the antifuse layer having a thickness of 61 nm (col. 4, lines 29-32).

Regarding claim 15, Hawley et al. teach the layer of the barrier metal having a thickness of 200 nm (col. 4, lines 5-9 & col. 6, lines 26-30).

Claim 16 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hawley, Jain, and Gangopadhyay, as applied to claim 11 above, and further in view of Han et al. (US 6,583,953).

Hawley et al. do not teach SiC used as an adhesion-promoting layer for the carbon. Han et al. teach in Fig.4, a SiC interlayer (60) forms as an adhesion layer for Carbon layer (66). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to select SiC instead of SiN as an adhesion layer that would have improved adhesive properties over conventional silicon-based adhesion layers like SiN (col. 4, lines 21-24).

Claim 19 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hawley, Jain, and Gangopadhyay, as applied to claim 11 above, and further in view of Forouhi (US 5,181,096).

Hawley et al. do not teach a tungsten layer atop the barrier metal layer. Forouhi in Fig.1 teaches a tungsten layer (30) formed on the barrier metal (28). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was

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made to combine the teaching of Forouhi in Hawley in order to produce a device with a process compatible electrode.

### ***Response to Arguments***

The declaration under 37 CFR 1.132 filed 07/25/2008 is insufficient to overcome the rejection of claims 11, 12, 14-19 based upon references applied under 35 U.S.C. 103 as set forth in the last Office action because: facts presented are not germane to the rejection at issue.

The arguments refer only to the system described in the above referenced application and not to the individual claims of the application. Thus, there is no showing that the objective evidence of nonobviousness is commensurate in scope with the claims. See MPEP § 716. The limitations on which applicant relies (the antifuse does not switch, the antifuse uses a current of only about 1 mA, the programming voltages are in the range of 5V) are not stated in the claims. It is the claims that define the claimed invention, and it is claims, not specifications that are anticipated or unpatentable. *Constant v. Advanced Micro-Devices Inc.*, 7 USPQ2d 1064. In other words, it does not matter that the prior art reference do not operate in the same manner as applicant's device where applicant's arguments are based on limitations not appearing in the claims. *In re Self*, 671 F.2d 1344, 213 USPQ 1 at 5 (CCPA 1982). Applicant cannot read limitations only set forth in the description into the claims for the purpose of avoiding the prior art. *In re Sporck*, 386 F.2d 924, 155 USPQ 687 (CCPA 1967).

Applicant also contends that the Gangopadhyay reference is non-enabling because it is inoperative and may not be used as prior art in any rejection under 102 or 103. The examiner respectfully disagrees with the remark because the standard for enablement for prior art anticipation is lower than the standard for obtaining a patent. Thus, if the disclosure was enabling enough to obtain a patent, then it was enabling enough for anticipation. Furthermore, "Even if a reference discloses an inoperative device, it is prior art for all that it teaches." *Beckman Instruments v. LKB Produkter AB*, 892 F.2d 1547, 1551, 13 USPQ2d 1301, 1304 (Fed. Cir. 1989). Therefore, "a non-enabling reference may qualify as prior art for the purpose of determining obviousness under 35 U.S.C. 103." *Symbol Techs. Inc. v. Opticon Inc.*, 935 F.2d 1569, 1578, 19 USPQ2d 1241, 1247 (Fed. Cir. 1991). Also, the examiner relies only on the teaching of an antifuse layer containing hydrogen doped amorphous carbon of Gangopadhyay as an effective antifuse material to substitute for the material used in the antifuse layer 24 of Hawley. The alleged adhesion problem in Gangopadhyay is irrelevant because the adhesion technique of adhering the device to the substrate of Gangopadhyay is not used in the modified Hawley's structure.

### ***Conclusion***

**THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not

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mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thien F. Tran whose telephone number is (571) 272-1665. The examiner can normally be reached on 7:30AM - 4:00PM Monday through Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Drew N. Richards can be reached on (571) 272-1736. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.



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